

## INDO-PACIFIC ORIGIN GASTROPOD SPECIES IN THE AEGEAN SEA. *MELIBE FIMBRIATA* ALDER & HANCOCK, 1864 A NEW INVADER.

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Abstract: *Melibe fimbriata* Alder & Hancock, 1864 of Indo-Pacific origin is recorded for the first time from the Aegean Sea. The distribution in the Aegean of other Gastropod species of similar origin, possible Lessepsian immigrants, is also discussed.

Riassunto: *Melibe fimbriata* Alder & Hancock, 1864, una specie a distribuzione Indo-Pacifica, viene segnalata per la prima volta nel Mare Egeo. Viene anche discussa la distribuzione di possibili gasteropodi lessepsiani in Egeo.

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### Introduction

*Melibe fimbriata* Alder & Hancock, 1864 is a species of the world-wide nudibranch family Tethyidae (Suborder Dendronotacea Odhner, 1934). This species, which is a well-documented member of the Indian Ocean mollusc fauna, has been reported for the first time in the Mediterranean Sea from the Astakos inlet on the Ionian coast of Greece (THOMPSON & CRAMPTON, 1984). The same authors suggested that the species had entered the Mediterranean via the Red Sea and the Suez Canal and thus it can be considered as a Lessepsian immigrant, an opinion supported also by BARASH & DANIN (1986). THOMPSON & CRAMPTON (1984) also suggested that the species was expected to appear in other parts of the Mediterranean as their observations in Astakos inlet were based on a breeding population. Some years later this species appeared also in Djerba in Tunisia according to CATTANEO-VIETTI *et al.* (1990).

### Material

Large numbers of specimens of the species were observed in a geothermally heated area (Paleohori Bay) in Milos Island in the South Aegean Sea in October 1994. The specimens were drifting, swimming and creeping around and among *Cymodocea nodosa* beds (surface area of 500 m<sup>2</sup>, density ranging from 40 to 50 shoots/ 400 cm<sup>2</sup>) covering the sandy bottom (Md = 0.4 mm) at depths from 10 to 12 m. The water temperature was 22.60 °C and the salinity near the bottom was 39‰. Two specimens were collected, preserved in weak formalin (10%) and were then deposited in the Museum Collection of the I.M.B.C.

## Results and Discussion

Both specimens of *Melibe fimbriata* collected from Milos Island present the characteristic features given by THOMPSON & CRAMPTON (1984) and CATTANEO-VIETTI et al. (1990) which clearly differentiate this species from *Tethys fimbria* Linnaeus, 1767, the representative species of the family Tethyidae in the Mediterranean

On the other hand field observations on the swimming movements of the specimens in Milos, and differences in size and the general morphology of the animal do not leave any doubt for confusion as to the identification of our specimens and the distinction from the only other *Melibe* species of the Atlantic, *Melibe rosea* Rang, 1829 [an endemic species from the Cape Province according to THOMPSON & CRAMPTON (1984) and GOSLINER (1987)]. Two other *Melibe* species have been recorded in the Red Sea i.e. *Melibe bucephala* Bergh, 1902 (BARASH & ZENZIPER, 1994) and *Melibe rangi* Bergh, 1875 (BERGH, 1875). According to the original descriptions, *M. bucephala*, in comparison with *M. fimbriata*, is smaller (up to 60 mm in length), the head has a different form (thin edge and almost smooth) and rhinophore clubs have less number of leaves (BERGH, 1902) while *M. rangi* has a different body form and colour (long and narrow, dorsal surface and sides of the body greenish white) and also a different head form (BERGH, 1875). In any case, an examination of the holotypes of the species *M. bucephala* and *M. rangi* is necessary since their slight differences from *M. fimbriata* might prove that they are in fact, forms of *M. fimbriata*.

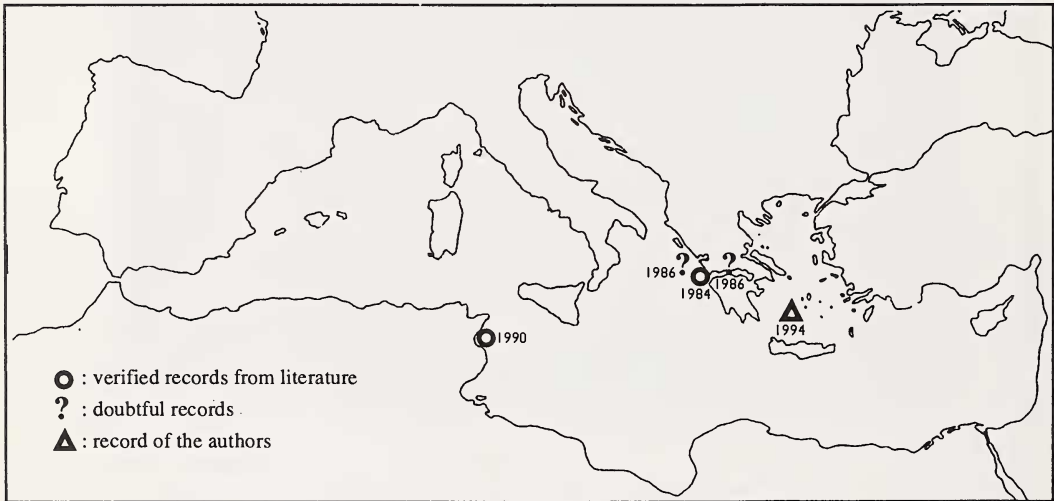


Fig. 1. Distribution of *Melibe fimbriata* in the Mediterranean Sea. Records derived from: THOMPSON & CRAMPTON (1984), MOOSLEITNER (1986) and CATTANEO-VIETTI et al. (1990).

Of special interest is the fact that the *Cymodocea nodosa* beds where the specimens were collected, are located close to a specific biotope covered with bacterial mats more than 100 m across, where the giant sulphur bacterium *Achromatium volutans* dominates. This biotope enriches the surrounding area, especially when strong wave actions prevail, with suspended material which is known that constitutes the food of *Melibe fimbriata* (THOMPSON & CRAMPTON, 1984). This might explain the absence of *M. fimbriata* from other *Cymodocea nodosa* beds which were also studied in Paleohori Bay and other sites of Milos Island as well as

from other areas of the Aegean, where the gastropod fauna has been intensively investigated during the last few years (KOUTSOUBAS, 1992; KOUTSOUBAS *et al.*, 1992; KOUTSOUBAS & KOUKOURAS, 1993; KOUTSOUBAS *et al.*, 1996).

The finding of *M. fimbriata* in Milos Island represents a first record in the Aegean Sea and extends its distribution in the Mediterranean (fig.1). In addition to the present record and those given by THOMPSON & CRAMPTON (1984) and CATTANEO-VIETTI *et al.* (1990), there are two more unconfirmed records from western Greece, namely Cephalonia Island in the Ionian Sea and Corinthiakos Gulf by MOOSLEITNER (1986). The author, without taking into account the previously published paper by THOMPSON & CRAMPTON (1984), had suggested that these might belong to the genus *Melibe*. From the illustrations, the description of the specimens, the biotope and finally the areas where this material was found (very close to Astakos inlet) we could surmise that these specimens most probably belong to the species *M. fimbriata*.

## Conclusions

The presence of Indo-Pacific origin species in the Mediterranean has been mainly attributed to immigration through the Suez Canal and these species have been considered as Lessepsian immigrants (POR, 1978; BARASH & DANIN 1982, 1986, 1992; POR & DIMENTMAN, 1989; GALIL, 1994; CHEMELLO & OLIVERIO, 1995). Even if this is true for the great majority of these species as it is indicated by their successful dispersal and settlement in the Levantine basin, other ways of invasion of these species in the Mediterranean should also be taken into consideration: invasion through human activities (GHISOTTI, 1971; ZIBROWIUS 1991, 1994) and/or entrance in the Mediterranean via the Gibraltar Straits (CATTANEO-VIETTI & THOMPSON, 1989).

The presence of *Melibe fimbriata* in the Aegean Sea increases the known number of gastropod species with an Indo-Pacific origin reported from this sea (Tab. I).

Table I - Indo-Pacific origin gastropod species recorded in the Aegean Sea.

Species	S. Aegean	N. Aegean
<i>Murex forskoehli</i> Roeding, 1798	Saronikos G. (SETTEPASSI, 1967)	
<i>Erronea caurica</i> (Linnaeus, 1758)	Rhodes Is. (SETTEPASSI, 1968; BARASH & DANIN, 1988/89)	
<i>Nerita sanguinolenta</i> Menke, 1829	Karpathos Is. (NORDSIECK, 1973)	
<i>Strombus decorus</i> (Roeding, 1798)	Rhodes Is. (NICOLAY, 1986; BARASH & DANIN, 1988/89)	
<i>Rapana rapiformis</i> (Von Born, 1778)	Rhodes Is. (BARASH & DANIN, 1988/89)	
<i>Alvania dorbignyi</i> (Audouin, 1827)	Rhodes Is. (TENEEKIDIS, 1989)	
<i>Rapana venosa</i> (Valenciennes, 1846)		Thermaikos G. (KOUTSOUBAS & VOULTSIADOU - KOUKOURA, 1991)
<i>Bursatella leachi</i> Blainville, 1817	Salamina Is. (BARASH & DANIN, 1986)	Mytilini Is., Chios Is. (BARASH & DANIN, 1986); Thermaikos G., Chalkidiki Pen. (KOUTSOUBAS, 1992)

Of the gastropod species of Indo-Pacific origin which have been reported so far from the

Aegean Sea (Tab. I), only the species *Bursatella leachi* and *Murex forskoehlII* can be considered as successful Lessepsian immigrants. The former occurs in the Levantine Basin from where it has spread to the Aegean and other parts of the Mediterranean (ZAKLIN & VIO, 1989), the latter is fairly common on the coast of Israel (BARASH & DANIN, 1992 under the name *Murex tribulus*) and the southeastern Turkey (OLIVERIO personal communication).

The finding of *Rapana venosa* in the Aegean suggests that this species has probably been carried there by ballast water as occurred with its entry into the Black Sea and its distribution in other areas of the Mediterranean (GHISOTTI, 1971; ZIBROWIUS, 1991). *Strombus decorus* apart from Rhodes island has also been reported from Turkey, Lebanon, Cyprus and Israel (BARASH & DANIN, 1992) but its invasion in the Eastern Mediterranean does not appear to conform to lessepsian immigration (ZIBROWIUS, 1991) but accidental introduction by man (CHEMELLO & OLIVERIO, 1995).

*Nerita sanguinolenta* apart from its record from Karpathos island has not reported yet in other areas of the Mediterranean while *Erronea caurica* and *Rapana rapiformis* apart from Rhodes island have also been reported from Turkey, Western Greece and Italy (GHISOTTI, 1974) and from Israel (BARASH & DANIN, 1977) respectively. The records of the above mentioned species from the Aegean and other areas of the Mediterranean were based on the discovery of empty shells thus their presence in the Mediterranean should be considered with a great deal of reserve. This opinion, at least for the species *E. caurica* and *R. rapiformis*, has also been suggested by BARASH & DANIN (1988/89) "page 11...their occurrence in the Mediterranean might be occasional and the prospects of their settlement in the Mediterranean are questionable".

*Alvania dorbignyi* before [Tenekidi's] record from Rhodes island was known only from the coast of Israel (NORDSIECK, 1972). The origin of this species is under consideration. BARASH & DANIN (1972, 1977, 1982, 1992) have considered it as an Indo-Pacific species immigrated in the Mediterranean from the Red Sea but according to MIENIS (1985) *Alvania dorbignyi* is a true Mediterranean species whose distribution is confined to the Eastern Mediterranean.

The hitherto known distribution of *Melibe fimbriata* in the Mediterranean should be considered as difficult to interpret as there are no records of this species from the Red Sea (THOMPSON & CRAMPTON, 1984) although other species of the genus *Melibe* have been found there (BARASH & ZENZIPER, 1994). Furthermore the species has not been found yet in the Levantine Basin and especially along the coast of Israel, a well investigated area but also the area of acclimatisation of the successful Lessepsian immigrants.

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